

Editor's note: The original column for this month by Dr. Anthony Caesar has been rescheduled. Instead we feature research by Dr. Tom Shanower.

By Dr. Tom Shanower

Research Entomologist – USDA ARS NPARL, 1500 N. Central, Sidney, MT 59270;
tshanowe@sidney.ars.usda.gov; 406-433-9405

The wheat stem sawfly

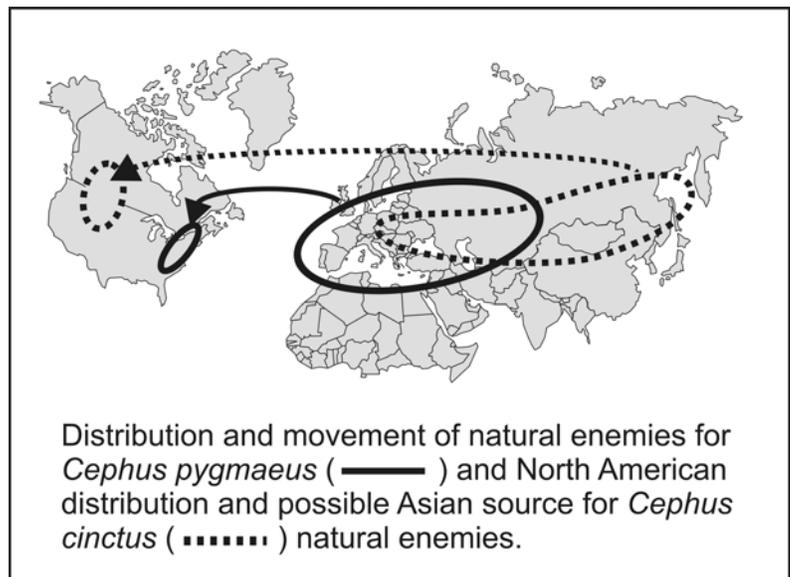
The wheat stem sawfly, *Cephus cinctus*, is a widely distributed, key pest of wheat in the northern Great Plains. This pest reduces yields in Montana, North and South Dakota, Nebraska, Colorado, Wyoming, Alberta, Saskatchewan, and Manitoba. The greatest yield losses, up to 80%, have been reported from Montana, though even light infestations can reduce profits when small yield reductions are spread over a wide area.

Current control tools

Current management practices are limited to using resistant wheat cultivars or various tillage operations to destroy sawfly larvae or pupae in the stubble. Several resistant cultivars have been developed and released over the past 10 years. These cultivars have solid stems filled with pith, and suffer less damage when sawfly numbers are high. Unfortunately they often yield less or have lower protein content than hollow-stemmed cultivars. Spring or fall tillage may also reduce populations of wheat stem sawfly, though this management practice requires additional field operations, increases production costs, and may increase soil erosion rates. Pesticides are ineffective because the larvae are protected within the stem, and are generally too costly.

Biological control

Another important approach to managing pests such as the wheat stem sawfly is biological control. Biological control uses natural enemies, parasites, predators or pathogens, to keep a pest below damaging levels. Several native parasites attack the wheat stem sawfly in the Great Plains, though they are often not effective in preventing damage. Biological control has been particularly effective against exotic pests in relatively low value crops or farming systems.



At the Northern Plains Agricultural Research Laboratory in Sidney, the possibility of finding and utilizing natural enemies of the wheat stem sawfly is currently being investigated. This is not a new idea. In the 1930s and 1950s successful biological control programs were conducted against related sawflies in eastern North America. The parasites that were introduced came from France and England. They were also released in Montana and North Dakota but did not survive, probably because the winters are much harsher on the Great Plains than in Europe.

One thing different about the new biological control effort is that natural enemies are being collected from northeastern Asia: northern China, Mongolia and Siberia. These areas are climatically much more similar to the northern Great Plains than France and England, where earlier collections were made. Unfortunately these are difficult areas to travel in and we know relatively little about these places, making the search for parasites difficult.

A promising new agent

We have collected one parasite from China already and it is being evaluated in the quarantine at Montana State University in Bozeman. This parasite was collected from a related species of sawfly that attacks wheat in China, but it is not yet clear whether it will attack the North American wheat stem sawfly. Research will also be conducted to determine if it is adapted to the climatic conditions of the northern Great Plains.

This parasite is new to science and does not yet have a specific name but belongs to the Ichneumonidae family. As far as is known, one or more species of Ichneumonidae attacks each species of sawfly, with the exception of the North American wheat stem sawfly. Most of these sawfly species are found in Europe and Asia. No ichneumonid parasite has ever been found attacking *Cephus cinctus* in North America. This is interesting and suggests that there may be a niche available for another natural enemy. Much work needs to be done before these ideas can be verified.

How it works

The ichneumonid parasite has an interesting biology that is synchronized with the sawfly. Female parasites deposit eggs into the wheat stem sawfly egg shortly after it is placed in the elongating stems of host plants in early summer. The parasite egg hatches before the sawfly egg hatches and the parasite larva remains within the sawfly larva throughout the season. The sawfly larva moves down to the base of the stem as the plant matures. It chews a V-shaped notch around the inside of the stem and



Female wheat stem sawfly laying an egg.

plugs the center to form a stub. The sawfly larva undergoes an obligatory diapause within the stub and emerges as an adult in the spring.

If the sawfly larva is parasitized, then the ichneumonid kills the sawfly larva in the spring and emerges from the stub. The ichneumonid parasite emerges from the parasitized sawfly at about the same time as unparasitized sawfly adults emerge. This close synchronization between emergence times ensures that sawfly eggs will be available for the ichneumonid to lay their eggs into.

Also interesting is that the ichneumonid may lay more than one egg into a sawfly egg. This results in multiple ichneumonid larvae in the sawfly larva. More than 25% of the sawfly larvae we collected in China in 1999 contained more than 1 ichneumonid larvae, and one even had 4 parasite larvae. If more than 2 parasite larvae are in the same sawfly host, they will fight until only one remains. The survivor will emerge and each sawfly larva can only support the development of a single ichneumonid parasite.

Future directions

Much research remains to be conducted to determine if this ichneumonid parasite will successfully attack the wheat stem sawfly in North America. We are also continuing to search for new and possibly more effective natural enemies.

Coming Next Month – Dedication News

Next month, this column will feature our upcoming Dedication celebration set for Saturday, Aug. 10, but we need your help. Among the displays planned is one incorporating information, pictures, etc. on former employees and lab supporters. If you fit into either of these two categories or know someone who does, we'd like to hear from you so that we may include your name, pictures or other pertinent items or information in our display. Please contact Beth Redlin at 433-9427 or at bredlin@sidney.ars.usda.gov for additional information.